

**Oroville Facilities Relicensing Efforts  
Environmental Work Group  
Draft Narrative Reports for Resource Action Discussion**

**Resource Action:** EWG-98

**Task Force Recommendation Category:** 2

**Proposed Creation or Enhancement of Salmonid Spawning and Rearing Habitat in the Tributaries of the Lower Feather River**

**Date of Field Evaluation:** September 16, October 29 and November 6, 2003

**Evaluation Team:** Brad Cavallo, Koll Buer, Eric See, Jason Kindopp, Richard Harris, Bruce Ross, and Michael Manwaring

**Description of Potential Resource Action Measure:**

The goal of this Resource Action is to create or enhance salmonid spawning and rearing habitat in tributaries of the lower Feather River. This habitat would supplement existing habitat in the main stem and partially replace upstream habitat that was lost when Oroville Dam was constructed. Depending on the site involved, implementation of this measure may require habitat construction or restoration and/or provision of year-round water supplies. Water supplies could be derived from project waters or other sources and delivered to tributaries by construction or extension of diversions, channels, or conduits.

At the present time, it appears that tributaries downstream from Oroville Dam (exclusive of the Yuba and Bear Rivers) are not utilized for spawning or rearing by anadromous salmonids.

Potential sites for spawning and rearing habitat creation/enhancement were evaluated as part of several field trips conducted on September 16, October 29 and November 6, 2003 with DWR, Butte County, and consultant staff. Potential sites investigated included: North Honcut Creek, South Honcut Creek, Wilson Creek, Ruddy Creek, an unnamed creek that is located near Highway 70, and an unnamed channel located near the hatchery.

There are several other Resource Actions that are either similar to or otherwise related to this measure:

- EWG-13A/20 and EWG-13B that propose to improve rearing habitat through placement of wood and other materials in the low flow reach and lower Feather River.
- EWG-16A and EWG-16B, that propose to create or enhance side channel habitat in the low flow reach.
- EWG-99, which would involve creating or enhancing side channel habitats in the lower Feather River.

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**Nexus to the Project:**

Many factors, including flood control levees, construction of the dam at Lake Oroville, historic land use activities (hydraulic mining), and regulation of stream flows have caused changes to geomorphology and substrate in the Feather River system. The cumulative impacts of these changes have generally reduced the availability (quantity and quality) of spawning and rearing habitat for anadromous fishes. Replacement of habitat lost or degraded due to the construction of the dam would improve the productivity of the anadromous salmonid fishery.

**Potential Environmental Benefits:**

The most immediate potential benefit of the proposed Resource Action would be an increase in the available spawning and rearing habitat for Central Valley steelhead and Chinook salmon, specifically Central Valley spring-run Chinook salmon, both threatened species under the Endangered Species Act. Ultimately, improvements in habitat should result in improved fish production and escapement.

**Potential Constraints:**

Constraints on this measure are both general and site-specific. An overriding constraint is availability of funding to carry out major stream habitat restoration projects in tributaries. None of the sites investigated currently has especially favorable habitat conditions for spawning or rearing. Consequently, a variety of physical habitat improvements would be necessary at any of the sites.

A second general constraint is the availability of water. Except from the site near the Hatchery, none of the additional locations investigated currently has a reliable source of year-round water that is of suitable quality for anadromous fish production. The quantity and quality constraints vary by site.

Other site-specific constraints are discussed in the evaluations below.

**Existing Conditions in the Proposed Resource Action Implementation Area:**

It is generally understood that availability of spawning and rearing habitat are limiting factors for production of steelhead and, perhaps, spring-run Chinook salmon in the Feather River below Oroville Dam. The construction of the dam precluded passage of fish to the upper Feather River where favorable habitat conditions were historically present for steelhead and spring Chinook. Therefore, the intention of this measure is to provide replacement habitat in tributaries below Oroville Dam. With the exception of the Yuba and Bear Rivers, there are few such tributaries. The major tributary is Honcut Creek. Consequently, the main focus of this investigation was on Honcut Creek. However, some additional tributaries were identified and evaluated as well.

**Honcut Creek:** For the purposes of this Resource Action, North Honcut Creek, South Honcut Creek, and Wilson Creek were investigated to evaluate their potential for habitat creation and/or enhancement. Ten sites along the three streams were evaluated (including one stop at Natchez Creek, a tributary to South Honcut Creek).

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It should be noted that at the present time, there is no evidence available that indicates any significant usage of the Honcut Creek system by anadromous salmonids.

One important issue that was not addressed for Honcut Creek was fish passage. Neither access, nor time available to conduct this study allowed evaluation of whether or not fish would be able to navigate Honcut Creek or its tributaries. Passage barriers could include diversion dams (one was observed in the upper watershed), culverts or bridges or high gradient stream sections. There does not appear to be any barrier present at the confluence of Honcut Creek with the Feather River.

With respect to the availability of water in Honcut Creek and its tributaries, at the present time, South Feather Water & Power (formerly Oroville-Wyandotte Irrigation District) owns water rights and diverts some level of flow (presently unknown) from Honcut Creek to the South Fork of the Feather River. Other appropriated rights undoubtedly also exist in the downstream reaches. Riparian rights are utilized by landowners throughout the watershed. In addition, wells in near-stream alluvial deposits were observed during the site visits. There is also not presently a reliable source of year-round water supply for instream uses at Honcut Creek.

At the ten sites in the watershed that were observed in the field, several conditions were noted:

- Stream water temperature,
- Stream flow
- Channel substrate
- Riparian vegetation
- Habitat types
- Stream gradient
- Water quality

In the upper watershed, there were reaches of stream with somewhat favorable habitat conditions. That is, they had appropriate habitat types (pools, side channels, and riffles), good riparian cover and at least some spawning gravels. However, low streamflow and attendant high water temperatures were ubiquitous. Also, predatory pikeminnow were frequently observed. Habitat conditions deteriorate with distance downstream. Aggradation with fine sediment has impacted the lower reaches, obliterating pool-riffle sequences. Streamside riparian cover is discontinuous. Water quality visibly declines and water temperatures increase.

In summary, the Honcut Creek system appears to be seriously limited as a potential site for creation or enhancement of anadromous salmonid habitat. The main constraints are (potentially) passage, water availability, habitat quality, presence of predatory species and water quality (temperature and nutrients, primarily). There may be additional

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constraints associated with the prevalence of private land in the watershed and willingness of landowners to engage in restoration efforts.

**Other Tributaries.** For the remainder of the tributaries evaluated, the following site characteristics were examined:

- Site length and/or area
- Site connectivity to the Feather River
- Instream habitat quality
- Riparian habitat quality
- Proximity of site to spawning habitat
- Existing streamflow
- Streamflow requirements

On the basis of field observations by all participants, the specific constraints and opportunities related to salmonid habitat restoration and enhancement at each site were discussed. At all sites evaluated, additional information would be required to develop a concept for implementation.

**Ruddy Creek:** Prior to the construction of the Oroville project, Ruddy Creek traversed the present location of the Thermalito complex. Its former headwaters were in the Table Mountain area. Pre-Oroville project topographic maps (1952) indicate that it was then an intermittent stream terminating in a dredger tailings pond. At the present time, it exists as three separate channels originating at the base of the Forebay. From there, the channels eventually merge into a single channel that presently has its terminus at a pond in the Oroville Wildlife Area.

There is no historical evidence indicating that Ruddy Creek ever provided habitat for anadromous salmonids.

Ruddy Creek is approximately 4 miles long. FEMA floodplain maps indicate that it has a substantial 100-year floodplain below Thermalito. At the present time, it is not directly connected to the Feather River. It may connect when flooding of its terminal pond coincides with high flows in the Feather River (>10,000 cfs). Instream habitat quality is generally poor. Channel conditions vary in a downstream direction. At its origin, the three branches are essentially wetlands with little channel definition. Further downstream, in the vicinity of Tehama Street, it is an open ditch that has been recently cleared. In the vicinity of Biggs Street, it is a grassy channel. Overall, except perhaps for the Oroville Wildlife Area, the stream has no current value as habitat for anadromous or other fish. Riparian habitat quality is equally limited. In the upstream area, except immediately downstream from the Forebay, the riparian zone is essentially absent. Further downstream, there is some riparian cover, but most of it consists of exotic species such as annual grasses, eucalyptus and giant reed. In the Oroville Wildlife Area, riparian cover is of higher quality, consisting of cottonwood and

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other native (as well as exotic) species. There was some water in the stream during field observations. The sources for streamflow are seepage from the Forebay (toe drains discharge directly to the Ruddy Creek channels), local runoff and return flows from developed or agricultural areas and perhaps, groundwater discharge to the stream.

If a project focused on salmonid habitat restoration were to be implemented on Ruddy Creek, there would be at least two major constraints. First, streamflow would be needed. This could be provided with a conveyance facility from the Forebay or in conjunction with a proposal to divert cold water from the Afterbay. It is estimated that re-watering the stream would require about 15-20 cfs. This would be minimum flow and would not account for channel maintenance or scouring flows that might be required. Second, a permanent connection between Ruddy Creek and the Feather River would be needed. There are a few options for doing that. For example, a new channel could be constructed from the present terminus to the Feather River or a connection could be made with a combination of the old Western Canal and Ruddy Creek. In either of these cases, a major geomorphic restoration effort would be needed, including provisions for breaching levees.

Additional factors that limit the suitability of Ruddy Creek as a site for salmonid habitat restoration include its flat gradient, lack of sinuosity and other natural stream channel features, unsuitable substrate, existing and proposed adjacent land uses, water quality and perhaps, barriers associated with road crossings and other obstructions.

If the emphasis on restoration of Ruddy Creek had different objectives than salmonid habitat creation or enhancement, other opportunities arise. For example, if restoration of Ruddy Creek were based on improving aesthetics, flood management and wildlife habitat, there would not be a need to connect with the Feather River. However, re-watering Ruddy Creek may have other impacts that would require further consideration.

An additional alternative would be to focus salmonid habitat restoration in the lower reaches in the Oroville Wildlife Area. In this case, options for water supply should be evaluated. If water were supplied from the Forebay, there would likely be concerns about water losses and temperature (increasing) because of the distance that the water would need to travel.

**Unnamed Tributary Near Highway 70.** This tributary in the northern portion of the city of Oroville is an open channel from about Grand Avenue, crossing under Highway 70 and apparently terminating at a pond upstream from the Feather River. Although the confluence was not examined in the field, the stream does not appear to be directly connected to the Feather River. It is approximately 0.5 mile in length. It is partly bordered by land that is under development. Instream

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habitat quality is relatively poor. Riparian habitat varies, but it is generally dense and dominated by exotic species. The stream would have its confluence in the vicinity of important spawning habitat in the Feather River. At the time of field observations, there was some flow, most likely emanating from urban runoff.

The constraints to creating or enhancing habitat in this tributary would include providing a connection to the Feather River and ensuring an adequate water supply. Instream habitat restoration would be necessary.

**Unnamed Tributary Near Hatchery.** This field evaluation was not intended to cover the Hatchery Ditch or Moe's Ditch. The potential for enhancing habitat in those channels was evaluated in the report on EWG-16B. The focus of this evaluation was on a channel located at the base of the terrace near the rear of the Hatchery.

The channel may be a secondary channel or former main channel of the Feather River or it may be an artifact of past hydraulic mining. Its location at the base of the terrace suggests it was a Feather River channel, and is about one mile long. It is not presently connected to the Feather River. The upstream end was not visited but apparently terminates upstream from the Hatchery. The downstream end is abruptly terminated by an unculverted road fill. The entire area adjacent to the channel consists of dredge spoils. These have obliterated not only the former floodplain but also the former channel below the road fill and the connection to the Feather River.

(Note: A possible continuation of the channel at the base of the terrace appears on topographic maps but was not visited in the field. On maps, this continuation appears to cross under Highway 70 and join the unnamed tributary, previously described. Further study of this channel may be warranted.)

The channel currently sustains little if any surface flow. There is no channel definition or instream habitat. Riparian vegetation, including both native and exotic species, completely occupies the channel.

There would be opportunities and constraints associated with a habitat improvement project in this channel. It could serve as rearing habitat for steelhead. However, there would have to be a re-connection to the Feather River. This could be achieved by constructing a new channel from the current downstream terminus, across dredge spoils, to the river. This new channel could serve as spawning habitat if it has the proper geomorphology and substrate. The new channel should be reconstructed within the boundaries of state-owned property to avoid conflicts with other landowners. In addition to channel construction and re-connection to the Feather, a major restoration effort would be required within the channel. This would probably entail clearing existing vegetation and use of instream structures. To sustain flows, approximately 20 cfs

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would be required, in addition to other flows for channel maintenance. The probable source for this water would be the Hatchery water supply, which consists of approximately 120 cfs. About 40 cfs is available from this source. Half could be used for the new channel and half could be used as a permanent source of water for Hatchery Ditch.

**Design Considerations and Evaluation:**

The choices for creating and enhancing habitat in downstream tributaries are clearly limited. For any of the potential sites, there are three overarching design considerations:

- Water supply
- Connectivity to the Feather River
- Instream habitat quality

**Water Supply.** At any site, a permanent source of water supply must be procured before proceeding with detailed restoration planning or design. Although each site has different opportunities for procuring water supply, the two general sources are either project or non-project waters. In the case of the Honcut Creek tributary system, diverting project waters to the headwaters where the most suitable habitats exist would require construction of conveyance facilities. As an alternative, an effort could be made to procure or exchange water rights held by the irrigation district and/or landowners.

It would be relatively easy to provide project waters to Ruddy Creek. Water could be diverted directly from the Forebay to one or more of the channels originating there. There is also a proposal to divert cold water from the Afterbay that could provide water to the downstream reaches of Ruddy Creek.

Although not examined in the field, the Highway 70 tributary appears to have its origin approximately 0.5 mile from the Thermalito Power Canal. However, in that upstream area the stream appears to be at least partially underground. The canal is a potential source of project waters.

Providing water supply to the channel near the Hatchery would require diverting flow that would otherwise service the Hatchery. However, the water supply demands at the Hatchery do not require its total allocation so the water would be available.

**Connectivity.**

The connectivity of the Honcut Creek system to the Feather River at the confluence appears to be adequate.

Ruddy Creek is not currently connected to the Feather River under normal flow conditions..

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The Highway 70 tributary is not connected to the Feather River. It would be possible to construct a new channel across existing dredge tailings to reconnect it. The new channel could provide some spawning habitat.

The channel near the Hatchery is not connected to the Feather River either upstream or downstream. If it were connected downstream, it could provide both spawning and rearing habitat and there would be no need to create an upstream connection. A channel could be constructed from the downstream terminus across the dredge tailings to the Feather River. The newly constructed channel could provide spawning habitat and the existing upper reach could provide rearing habitat.

**Instream Habitat.** At any site, extensive instream habitat improvements would probably be required. In the Honcut Creek system, the quality of habitat in the downstream reaches is poor. There is good quality habitat in the upper reaches.

None of the other tributaries evaluated has quality instream habitat. Ruddy Creek has virtually no current instream habitat values. The Highway 70 tributary has some instream structure in its upper reach near Grand Avenue. Encroachment by vegetation has eliminated any habitat values that may have been present in the Hatchery channel.

In summary, there are no easy solutions to creating or enhancing habitat for anadromous salmonids in tributaries downstream from Lake Oroville. The concept of enhancement is probably not even relevant. At any site chosen, at least some level of habitat creation would be required.

**Synergisms and Conflicts:**

Any project to improve conditions on tributaries should be considered within the context of a comprehensive program for improvements to spawning and rearing habitat for anadromous salmonids. In that way, different approaches to achieve the same objectives can be compared and evaluated. For example, there are at least three ways in which spawning and rearing habitat can be increased: 1) changes to the main stem of the Feather; 2) restoring access to upstream tributaries; or 3) treatments to tributaries. Resources, including funding and available water supply, may act as constraints on the amount of habitat creation and enhancement that can take place. Consequently, it will be important to make the best choices among the various options.

Treatments to tributaries can have synergistic effects with activities that seek to improve conditions in the Feather River.

Potential conflicts would likely arise in relation to specific proposals if this measure were implemented. In the Honcut Creek watershed, there may be conflicts with landowners over water supply, water quality and land use controls. On Ruddy Creek, even though there appears to be wide support within the community for a project that would improve aesthetics, there may be conflicts with individual landowners whose property would be altered to allow for a reworking of a stream channel. The location near the Hatchery

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would likely have the least conflicts with outside parties because the stream is totally contained within public property, however this measure could conflict with recreational PM&Es proposed for the same area (i.e., conflicting land usage, fishing restrictions or poaching concerns, etc).

There would not appear to be any conflicts between other Resource Actions and this one. However, there is the possibility that implementing this proposal would reduce the amount of resources available for implementing other measures.

**Uncertainties:**

There are numerous uncertainties associated with creating habitat on the tributaries. These are both general and site-specific. Site-specific constraints and concerns have been discussed previously. Probably the most important general uncertainty is whether or not habitat creation on tributaries will actually improve the productivity of the system.

**Cost Estimate:**

It is not possible to estimate the costs for implementing this Resource Action. Considering relative costs, the most unreasonable and expensive alternative would be to create and restore habitat in the Honcut Creek system. A project there would also have the highest level of uncertainty. Project costs can generally be ranked as follows: Honcut Creek>Ruddy Creek>Hatchery Channel>Highway 70 Channel.

Creating or restoring habitat on the other tributaries would be much less expensive than a project on Honcut Creek but would nevertheless be costly. Creating channels to connect tributaries to the Feather River would probably cost several hundred thousand dollars per mile of stream. That assumes relatively easy engineering and construction. Instream habitat improvements, such as structure placements and bioengineering would probably cost at least the same per mile of stream.

**Recommendations:**

There are no easy choices for this Resource Action. The following sequence of further investigations is recommended if this measure is to be carried forward:

For Honcut Creek system:

- Based on information gathered during this field effort, no further investigation of Honcut Creek is warranted.
- An alternative approach to restoration of the Honcut Creek system would be to explore watershed planning through the establishment of a local watershed group. Funding to support watershed planning is available through, for example 319-H grant funding through the State Water Resources Control Board.

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For Ruddy Creek:

- No further investigation of anadromous fish habitat in Ruddy Creek is warranted.
- The feasibility of restoring the stream for aesthetic, flood management and wildlife benefits could be considered.
- Decisions about flood management on Ruddy Creek are presently being made for downstream development (a private subdivision is being constructed south of the Afterbay diversion). A combined flood management/stream restoration alternative could be explored. Historically funding for such projects has been available from the DWR Urban Stream Restoration Program.

For the Highway 70 tributary:

- Based on the information gathered during this file study, no further investigation is warranted.

For the Hatchery channel:

- Confirm the availability of water supply.
- Evaluate the feasibility of constructing a downstream connection to the Feather River.
- Further evaluate the apparent continuation of this channel along the terrace to the vicinity of Highway 70.

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